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WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada



U. S. DEPARTMENT of AGRICULTURE ★ SOIL CONSERVATION SERVICE

Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
APR. 1, 1977

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1900 snow courses in Western United States and in the Columbia Basin in British Columbia. Networks of automatic snow water equivalent and related data sensing devices, along with radio telemetry are expanding and will provide a continuous record of snow water and other parameters at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

COVER PHOTO: SNOW COURSE MEASUREMENTS BY A SURVEY TEAM IN UTAH'S WASATCH RANGE.
ORC-254-10

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, West Technical Service Center, Room 510, 511 N.W. Broadway, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	Room 129, 2221 East Northern Lights Blvd., Anchorage, Alaska 99504
Arizona	Room 3008, 6029 Federal Building, Phoenix, Arizona 85025
Colorado (N. Mex.)	P. O. Box 17107, Denver, Colorado 80217
Idaho	Room 345, 304 N. 8th. St., Boise, Idaho 83702
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1220 S.W. Third Ave., Portland, Oregon 97204
Utah	4012 Federal Bldg., 125 South State St., Salt Lake City, Utah 84138
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 2440, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia



WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

ISSUED

APRIL 1, 1977

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, NOAA, National Weather Service, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

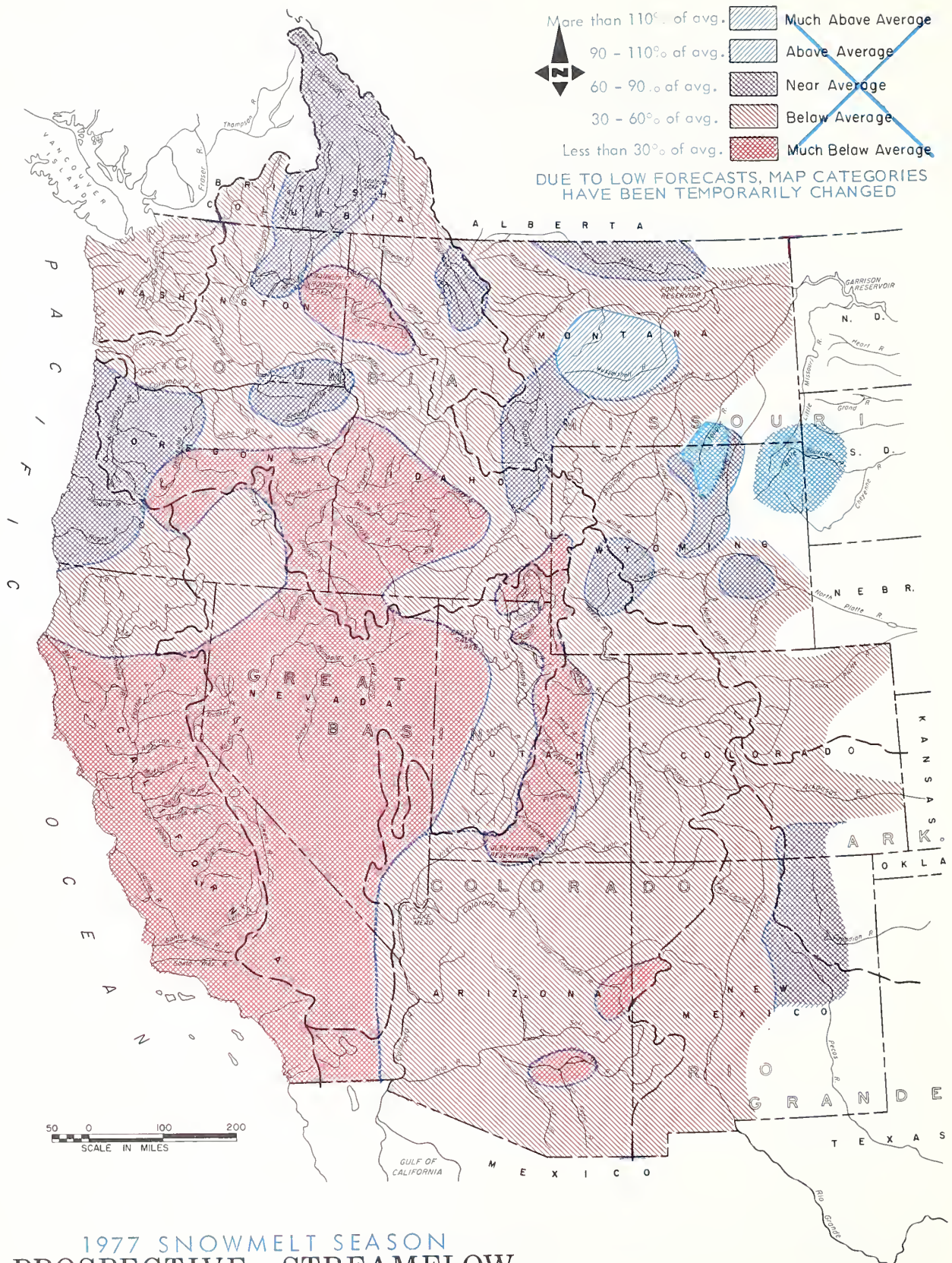
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Unit, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
R.M. DAVIS, ADMINISTRATOR



1977 SNOWMELT SEASON
PROSPECTIVE STREAMFLOW
AS OF APRIL 1, 1977

WATER SUPPLY OUTLOOK

1977 SNOWMELT SEASON
APRIL 1, 1977

WIDESPREAD SEVERE WATER SHORTAGES ARE FORECAST FOR MUCH OF THE WEST THIS SUMMER. ONE OF THE LIGHTEST SNOWPACKS OF THE CENTURY HAS ACCUMULATED ON MOUNTAIN WATERSHEDS. AS A RESULT, THE MELTING SNOW RUNOFF IN MANY RIVERS IS FORECAST TO BE LESS THAN EVER PREVIOUSLY RECORDED.

Snow surveying began in the west in 1906 on Mount Rose in Nevada. Since that time there has not been a winter with so little snow over such a widespread area of the west as was measured on this April 1. As a result, streamflow is forecast to be as low as any year this century in many of the region's rivers.

Snowfall during the latter part of February and the first three weeks of March was normal or heavier than usual over much of the Pacific Northwest and portions of the Rocky Mountains.

In spite of this series of storms, new historical record low snowpacks were measured on April 1 over a widespread area of the Colorado, South Platte, Arkansas, Rio Grande, Great Basin, and Missouri drainages as well as in the Sierra Nevada range. Although fewer individual records were set in the Columbia Basin, the combined figure for the entire basin is only one-half of normal and well below the previous record minimums of 1944 and 1973.

The Columbia River is expected to yield its lowest volume in 99 years at The Dalles, Oregon, gaging station. Tributaries such as the Yakima River and others heading in the Cascade Range are now expected to contribute from 28 to 55 percent of normal - a substantial improvement over the outlook one month ago. The Snake River, however, will provide less than one-half of its normal yield. Several central Idaho tributaries will flow at only 15 to 20 percent of their averages.

The streams heading in the Sierra Nevada will provide very little snowmelt runoff to California and Nevada water users. This is the second consecutive year of short water supplies and reservoir storage has been depleted to a level of only about one-half the normal April 1 storage. Most rivers will yield less than 25 percent of their average quantities.

The Colorado River Basin snowpack is very light. About one-half of the snow courses in both Utah and Colorado are currently at historic low levels. Direct diversion water users are expected to suffer from deficient supplies in most of the basin. However, reservoir storage is near average and will provide relief to many irrigators.

The Lower Colorado Basin in Arizona will have one of the smaller spring runoffs in

recent years, but reservoir storage is adequate for most water users.

The Arkansas, Rio Grande, and South Platte Basins have light snowpacks as well. The exception is along the Pecos drainage in New Mexico and the Cucharas in southern Colorado where near average snowpacks indicate a normal water supply. The Rio Grande is expected to flow at a near record minimum rate this summer.

The Upper Missouri and North Platte Basins in Montana and Wyoming have variable snowpack conditions. Many snow sources in Montana set new minimum records this month. In contrast, the northern portion of the Bighorn Range, the Snowy Mountains in Montana, and the Black Hills area are the major exceptions to the west-wide pattern of light snowpacks. In these areas the pack is above normal and adequate water supplies are forecast. Elsewhere in these basins, mid and late summer water supply shortages are expected.

The "Prospective Streamflow" map, on the opposite page, has been changed again for this issue of the "Water Supply Outlook" to illustrate more clearly the runoff picture. The reader is directed to the legend headings printed in blue for an explanation of the map categories.

Water conservation measures are needed wherever possible to help stretch the meager supplies in most areas. The Soil Conservation Service has prepared a series of four "TIPS" brochures which give conservation hints for crops and soils, pasture and range, irrigation, and yards and gardens. Copies can be obtained from local Soil Conservation Service and conservation district offices.

ALASKA

Maximum of record snowpack to near minimum conditions currently exist in different regions of Alaska. A heavy snow cover occurs throughout south central Alaska and eastern most portion of the Brooks Range. Meanwhile, lean snow conditions prevail in a belt just north of the Alaska Range including the Upper Kuskokwim and Tanana Valleys.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS AS OF APRIL 1, 1977

MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF:		MAJOR BASIN AND SUB - WATERSHED	WATER EQUIVALENT IN PERCENT OF:	
	LAST YEAR	AVERAGE		LAST YEAR	AVERAGE
MISSOURI BASIN			SNAKE BASIN		
Jefferson	42	51	Snake above Jackson, Wyo.	30	42
Madison	41	51	Snake above Hiese, Idaho	33	46
Gallatin	66	75	Henry's Fork	36	41
Missouri Main Stem	70	76	Southern Idaho Tributaries	44	50
Yellowstone	57	69	Big and Little Wood	20	17
Shoshone	48	56	Boise	24	26
Wind	29	40	Owyhee	33	40
North Platte	62	65	Payette	30	33
South Platte	40	39	Malheur	30	33
ARKANSAS BASIN			Weiser	35	36
Arkansas	53	51	Burnt	46	52
Cucharas - Purgatoire	83	83	Powder	37	38
RIO GRANDE BASIN			Salmon	32	35
Rio Grande (Colo.)	23	28	Grande Ronde	48	55
Rio Grande (New Mexico)	52	50	Clearwater	47	50
Pecos	667	100	LOWER COLUMBIA BASIN		
COLORADO BASIN			Yakima	33	32
Green (Wyo.)	32	38	Umatilla	44	78
Yampa - White	55	52	John Day	54	63
Duchesne	82	30	Deschutes - Crooked	33	40
Price	96	32	Hood	34	43
Upper Colorado	57	53	Willamette	38	52
Gunnison	42	40	Lewis	37	48
San Juan	25	30	Cowlitz	38	39
Dolores	24	20	PACIFIC COASTAL BASIN		
Virgin	93	28	Puget Sound	39	47
Gila	99	83	Olympic Peninsula	42	53
Salt	47	51	Umpqua - Rogue	32	35
Verde	28	31	Klamath	28	31
GREAT BASIN			Trinity	65	35
Bear	79	45	CALIFORNIA		
Logan	84	42	CENTRAL VALLEY		
Ogden	65	36	Upper Sacramento	40	25
Weber	103	57	Feather	65	20
Provo - Utah Lake	118	47	Yuba	75	30
Jordan	147	64	American	55	25
Sevier	131	58	Mokelumne	50	20
Walker - Carson	76	29	Stanislaus	65	20
Tahoe - Truckee	74	32	Tuolumne	65	25
Humboldt	42	53	Merced	85	25
Lake Co. (Oregon)	20	23	San Joaquin	65	20
Harney Basin (Oregon)	34	44	Kings	85	25
Owens	80	20	Kaweah	65	20
UPPER COLUMBIA BASIN			Tule	25	5
Columbia (Canada)	55	64	Kern	80	20
Kootenai	49	52	<i>Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.</i>		
Clark Fork	47	55			
Bitterroot	43	54	<i>Average is for 1958-72 period. California ave- rages are for the period 1931-70. Based on Selected Snow Courses determined by Distri- bution within the Basin. Length of Record and Repetitive Monthly Measurement Schedules.</i>		
Flathead	63	65			
Spokane	45	47			
Okanogan	50	53			
Methow	38	37			
Chelan	34	46			
Wenatchee	31	38			

A record deep snowpack was recorded near Valdez, Homer, and Anchorage in the south and Arctic Village, Fort Yukon and Venetie in the north. Snowpack records date back 20 years at some of these sites. Snowmelt runoff will be heavy in all drainages south of the Alaska Range and tributaries of the Porcupine River. Ship Creek near Anchorage is forecast to run 152 percent of average.

A well below average snowpack exists along the Tanana River agriculture belt. A few courses near Delta Junction and Fairbanks are the second lowest in 14 years of record. The Chena River at Fairbanks is expected to produce only 64 percent of its normal runoff.

ARIZONA

Water supplies will be adequate for most irrigation projects served by reservoir storage. The San Carlos Project, however, will be very short, requiring reductions in crop acreage and heavy pumping. Areas depending on direct diversions such as the Safford Valley will also require heavy supplemental pumping.

Arizona finally received a heavy snowfall after three months of much below average storm activity. By March 25 most of the snow below 8000 feet had melted, leaving only patches of snow on the shady north slopes. As of March 31, however, when most snow surveys were made, there was a significant amount of snow on almost all snow courses. The Verde Watershed did not fare as well as the White Mountains in March, but by April 3 they had 12 to 24" of new snow at the 7000' level. The Verde Watershed snow measurements do not reflect this more recent storm.

As of April 1 snow cover varied from 31% of average on the Verde to 83% on the Gila with the Salt and Little Colorado Watersheds 51 and 58% of average respectively. Based on high elevation snow cover, this year is the third lowest in the last 15 years.

The month end storm raised precipitation totals above average for the month at several stations in the White Mountains. Since November 1, however, accumulated precipitation is still close to half of normal on all watersheds.

Surface soil moisture was improved greatly by the recent storm, but the lower levels of the soil profile are still below average.

Reservoir storage is above average in the Colorado River reservoirs, somewhat below average on the Salt River Project, and much below average in Lake Pleasant and San Carlos Reservoir. Lake Pleasant,

containing 20% of capacity, is just 50% of average for this date. San Carlos is virtually empty with present storage less than 1% of capacity and 3% of average. No significant inflow can be expected this spring.

Total spring runoff (January-May) will be much below average throughout the state. Streamflow forecasts range from 20% of average on the Little Colorado River to 38% on the Verde. The Gila and Salt Rivers are expected to produce 25 and 28% of average respectively.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that this is the driest year of record in California. Central California has record-setting drought, the far northern part of the state has severe drought, and only coastal southern California has had near normal precipitation in this water year. Snow water content and runoff will set record lows in many watersheds this year. There is almost no possibility of any relief from the drought before November.

Forecasts of runoff indicate 16 major Central Valley and Eastside Sierra streams will produce their lowest flows of record for the April through July period. Projections of total water year runoff show that all Central Valley Streams from the Yuba River south, and most Lahontan area streams, will establish lowest flows of record by September 30, 1977.

Snowpack water storage on April 1 is the lowest in 47 years in all basins except the Trinity and Feather Rivers. In the Central Valley low snow records, set only last year, were broken again on the Stanislaus through the Kern River Basins. Data from snow sensors indicate that water content accumulation has peaked, and melt has started at all elevations. Based on the latest NASA satellite imagery, snow-covered area (SCA) at the time of peak accumulation in the five Southern Sierra watersheds of the San Joaquin through the Kern River Basins was 2,750 square miles. This was almost 10 percent more SCA than at peak accumulation a year ago. However, ground snow surveys and automatic snow sensor data show that this year's April 1 snow water content was 38 percent less than last year. The combination of information of SCA from satellite imagery and snow water content data from snow sensors is now being applied in refining snowmelt runoff forecasts as the melt season progresses.

Precipitation has averaged 35 percent of normal over the state for the water year

SELECTED STREAMFLOW FORECASTS APRIL 1, 1977

STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow In (1,000 A.F.)
	Flow In (1,000 A.F.)	Percent of Average		
CASKATCHEWAN				
St. Mary near Babb, Montana 1/	338	69	April-Sept.	
UPPER MISSOURI				
Beaverhead near Grant, Montana 2/	22	15	April-Sept.	244
Big Hole near Melrose, Montana	225	34	April-Sept.	
Madison near Grayling, Montana 3/	290	60	April-Sept.	575
Gallatin near Gateway, Montana	370	70	April-Sept.	
Sun at Gibson Dam, Montana 4/	270	46	April-Sept.	703
Belt near Monarch, Montana	115	93	April-Sept.	
Marias near Shelby, Montana 5/	205	37	April-Sept.	
Missouri near Landusky, Montana 6/	2,050	43	April-Sept.	
near Williston, North Dakota 7/	5,050	43	April-Sept.	
S.Fk. Musselshell above Martinsdale, Montana	47	94	April-Sept.	
Milk at Eastern Crossing, Montana	205	79	April-Sept.	
Yellowstone at Yellowstone Lake Outlet, Wyo.	440	54	April-Sept.	955
at Corwin Springs, Montana	1,180	59	April-Sept.	2,453
at Miles City, Montana 8/	3,250	51	April-Sept.	
Clarks Fork near Belfry, Montana	360	59	April-Sept.	
Shoshone below Buffalo Bill Res., Wyo. 9/	450	54	April-Sept.	1,037
Wind near Dubois, Wyoming	53	52	April-Sept.	146
at Riverton, Wyoming 10/	345	52	April-Sept.	736
below Boysen Res., Wyoming 11/	560	56	April-Sept.	1,100
Bull Lake Creek near Lenore, Wyoming	132	72	April-Sept.	178
Little Popo Agie near Lander, Wyoming	34	71	April-Sept.	40
Tensleep near Tensleep, Wyoming	48	60	April-Sept.	
Medicine Lodge near Hyattville, Wyoming	9	43	April-Sept.	
Shell Creek near Shell, Wyoming	65	89	April-Sept.	85
Big Horn near St. Xavier, Montana 8/	700	38	April-Sept.	2,007
Tongue near Dayton, Wyoming	135	119	April-Sept.	108
No. Fork Powder near Hazelton, Wyoming	9.5	95	April-Sept.	11.1
PLATTE				
North Platte near Sinclair, Wyoming	300	46	April-Sept.	
Encampment near Encampment, Wyoming	56	40	April-Sept.	142
Deer Creek at Glenrock, Wyoming	22	85	April-Sept.	81
Laramie Riv. & Pioneer Canal, nr Woods, WY 12/	60	47	April-Sept.	
Big Thompson at Drake, Colorado 13/	42	39	April-Sept.	
Clear at Golden, Colorado 14/	50	39	April-Sept.	
St. Vrain at Lyons, Colorado 15/	28	37	April-Sept.	
Cache LaPoudre near Fort Collins, Colorado 16/	105	43	April-Sept.	
ARKANSAS				
Arkansas at Salida, Colorado 17/	150	48	April-Sept.	
Cucharas near LaVeta, Colorado	8	80	April-Sept.	
Purgatoire at Trinidad, Colorado	23	61	April-Sept.	
RIO GRANDE				
Rio Grande near Del Norte, Colorado 18/	230	49	April-Sept.	
at Otowi Bridge, New Mexico 19/	225	39	March-July	
Conejos near Mogote, Colorado 20/	85	46	April-Sept.	
El Vado Res., Inflow, New Mexico	74	39	March-July	
Pecos at Pecos, New Mexico	35	85	March-July	
UPPER COLORADO				
Colorado, Grandby Res. Inflow, Colorado 21/	116	51	April-Sept.	
near Dotsero, Colorado 22/	645	45	April-Sept.	
near Cameo, Colorado 23/	1,090	46	April-Sept.	
near Cisco, Utah 24/	884	31	April-July	2,029
Lake Powell Inflow, Arizona 25/	2,150	31	April-July	5,395
Roaring Fork at Glenwood Springs, Colorado 26/	321	45	April-Sept.	
Uncompahgre at Colona, Colorado	51	38	April-Sept.	
Gunnison, Blue Mesa Res. Inflow, Colorado 27/	310	39	April-Sept.	
near Grand Junction, Colorado 28/	400	34	April-Sept.	
Dolores at Dolores, Colorado	81	35	April-Sept.	

Forecasts in California provided by Department of Water Resources.
Average is for 1958-72 period except California. California is computed for 1921-70 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.
Explanatory Notes on Forecasts listed on Inside Back Cover.

SELECTED STREAMFLOW FORECASTS

APRIL 1, 1977

STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow in (1,000 A.F.)
	Flow in (1,000 A.F.)	Percent of Average		
UPPER COLORADO (continued)				
Green at Warren Bridge, Wyoming	175	54	April-Sept.	347
at Green River, Wyoming <u>29/</u>	370	37	April-Sept.	1,222
Flaming Gorge Res. Inflow, Utah <u>27/</u>	375	32	April-July	1,329
at Green River, Utah <u>30/</u>	1,078	38	April-July	2,251
Big Sandy near Big Sandy, Wyoming	40	70	April-Sept.	62
Yampa at Steamboat Springs, Colorado	160	54	April-Sept.	
near Maybell, Colorado	450	50	April-Sept.	
Little Snake near Dixon, Wyoming	120	40	April-Sept.	254
White near Meeker, Colorado	155	52	April-Sept.	
Strawberry at Duchesne, Utah <u>40/</u>	5	9	April-July	
Duchesne near Tabiona, Utah <u>31/</u>	17.3	17	April-July	
at Randlett, Utah <u>40/</u>	7.4	3	April-July	
Lakefork below Moon Lake, Utah <u>32/</u>	25	36	April-July	
Uinta near Neola, Utah	19.4	22	April-July	59
Whiterocks near Whiterocks, Utah	14.5	25	April-July	47
Price, Scofield Res. Inflow, Utah <u>33/</u>	5.3	16	April-July	
Cottonwood near Orangeville, Utah <u>34/</u>	13	28	April-July	
San Juan, Navajo Res. Inflow, New Mexico <u>27/</u>	191	32	April-July	
near Bluff, Utah <u>35/</u>	258	30	April-July	634
Animas at Durango, Colorado	165	39	April-Sept.	
LOWER COLORADO				
Virgin near Virgin, Utah	17	35	April-June	23
Little Colorado above Lyman, Arizona	1.3	17	April-June	6
Gila near Solomon, Arizona	16	36	April-May	23
Frisco at Clifton, Arizona	8	34	April-May	11
Salt at Intake, Arizona	50	35	April-May	126
Tonto above Roosevelt, Arizona	3	36	April-May	14
Verde above Horseshoe Dam, Arizona	25	46	April-May	83
GREAT BASIN				
Bear at Utah-Wyo. State Line	45	40	April-July	80
at Harer, Idaho	30	10	April-Sept.	
Smith's Fork near Border, Wyoming	35	30	April-Sept.	135
Thomas Fork near Wyo.-Ida. State Line	6	19	April-Sept.	40
Logan near Logan, Utah <u>36/</u>	38	34	April-July	114
Ogden, Pine View Res. Inflow, Utah <u>27/</u>	29	26	April-June	93
Weber near Oakley, Utah	44	44	April-June	90
Provo near Hailstone, Utah <u>37/</u>	25	25	April-July	107
Strawberry Res. Inflow, Utah	5	11	April-July	38
Utah Lake Net Inflow, Utah	70	34	April-July	
Big Cottonwood near Salt Lake City, Utah	14	39	April-July	
Beaver near Beaver, Utah	7.1	36	April-July	9.2
Sevier near Hatch, Utah	12	29	April-July	25
near Gunnison, Utah	12.5	32	April-July	22
So. Fork Humboldt near Elko, Nevada	16	24	April-July	48
Humboldt at Palisades, Nevada	20	10	April-July	105
Truckee at Farad, California <u>38/</u>	40	15	April-July	59
East Carson near Gardnerville, Nevada	40	22	April-July	64
West Carson at Woodsfords, California	12	23	April-July	17
East Walker near Bridgeport, California <u>39/</u>	6	9	April-Aug.	8
West Walker near Coleville, California	45	31	April-July	50
Donner und Blitzen near Frenchglen, Oregon	31	58	April-Sept.	
Silvies near Burns, Oregon	22	30	April-Sept.	
Chewaucan near Paisley, Oregon	10	13	April-Sept.	64
Deep above Adel, Oregon	22	32	April-Sept.	
Bidwell near Ft. Bidwell, California	3.2	28	April-July	9.2
Owens below Long Valley Res., California	10	16	April-July	32
UPPER COLUMBIA				
Columbia at Birchbark, British Columbia <u>40/</u>	33,400	72	April-Sept.	53,937
at Grand Coulee, Washington <u>40/</u>	42,100	61	April-Sept.	80,974

Forecasts in California provided by Department of Water Resources
Average is for 1958-72 period except California. California is computed for 1921-70 period
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season
Explanatory Notes on Forecasts listed on Inside Back Cover

SELECTED STREAMFLOW FORECASTS APRIL 1, 1977

STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow In (1,000 A.F.)
	Flow In (1,000 A.F.)	Percent of Average		
UPPER COLUMBIA (continued)				
Columbia below Rock Island, Washington	45,200	60	April-Sept.	86,849
Kootenai below Libby Dam nr Libby, Montana	4,100	55	April-Sept.	8,012
at Leonia, Idaho	4,850	53	April-Sept.	
Blackfoot near Bonner, Montana	500	48	April-Sept.	
So.Fk. Flathead nr Columbia Falls, Montana <u>40/</u>	1,520	64	April-Sept.	2,489
Flathead at Columbia Falls, Montana <u>40/</u>	400	62	April-Sept.	6,785
near Polson, Montana <u>40/</u>	4,450	58	April-Sept.	8,187
Clark Fork above Missoula, Montana	890	49	April-Sept.	2,649
near Plains, Montana <u>40/</u>	6,400	50	April-Sept.	14,454
at Whitehorse Rapids, Idaho	7,000	50	April-Sept.	
Bitterroot near Darby, Montana	245	42	April-Sept.	836
Priest near Priest River, Idaho <u>41/</u>	450	51	April-July	
Pend Oreille below Box Canyon, Washington	6,700	42	April-Sept.	17,638
Kettle near Laurier, Washington	1,220	65	April-Sept.	
Spokane at Post Falls, Idaho <u>42/</u>	990	33	April-Sept.	
Similkameen near Nighthawk, Washington	715	47	April-Sept.	1,967
Okanogan near Tonasket, Washington	790	46	April-Sept.	2,135
Methow near Pateros, Washington	430	42	April-Sept.	
Stehekin at Stehekin, Washington	540	58	April-Sept.	
Chelan at Chelan, Washington <u>43/</u>	720	57	April-Sept.	1,467
Wenatchee at Peshastin, Washington	950	53	April-Sept.	2,134
SNAKE				
SNAKE above Palisades Res., Wyoming <u>44/</u>	1,200	46	April-Sept.	3,237
near Heise, Idaho <u>45/</u>	1,750	44	April-Sept.	
near Blackfoot, Idaho <u>46/</u>	2,000	48	April-July	
at Weiser, Idaho	3,000	46	April-Sept.	
Grey's above Palisade, Wyoming	78	20	April-Sept.	477
Salt above Palisade, Wyoming	70	19	April-Sept.	516
Henry's Fork near Ashton, Idaho <u>47/</u>	420	63	April-Sept.	
Teton near St. Anthony, Idaho	250	57	April-Sept.	
Big Lost near MacKay, Idaho <u>48/</u>	50	27	April-Sept.	
Little Lost near Howe, Idaho	18	44	April-Sept.	
Portneuf at Topaz, Idaho	40	43	March-Sept.	
Oakley Res. Inflow, Idaho	13	44	March-Sept.	
Salmon Falls Creek nr San Jacinto, Idaho	25	30	March-Sept.	
Little Wood above High 5 Crks, Idaho	15	16	April-Sept.	
Big Wood, Inflow to Magic Res., Idaho <u>49/</u>	60	19	April-Sept.	
Bruneau near Hot Springs, Idaho	75	33	March-Sept.	
Boise near Boise, Idaho <u>50/</u>	290	18	April-Sept.	
Owyhee near Owyhee, Nevada <u>51/</u>	9	13	April-July	85
Owyhee Res. Net Inflow, Oregon <u>27/</u>	95	29	April-Sept.	510
Malheur near Drewsey, Oregon	12.2	17	April-Sept.	
Payette near Horseshoe Bend, Idaho <u>52/</u>	500	27	April-Sept.	
Weiser above Crane Creek, Idaho <u>40/</u>	140	27	March-Sept.	
Burnt near Hereford, Oregon <u>40/</u>	6.6	20	April-Sept.	
Powder near Sumpter, Oregon	20	36	April-Sept.	
Eagle above Skull Creek, Oregon	64	33	April-Sept.	
Imnaha at Imnaha, Oregon	135	44	April-Sept.	
Salmon at Whitebird, Idaho	2,300	33	April-Sept.	
Lostine near Lostine, Oregon	76	61	April-Sept.	
Grande Ronde at LaGrande, Oregon	96	61	April-Sept.	246
Clearwater at Spalding, Idaho	3,500	41	April-Sept.	
LOWER COLUMBIA				
Yakima at CleElum, Washington <u>53/</u>	530	55	April-Sept.	
near Parker, Washington <u>54/</u>	480	28	April-Sept.	
Naches near Naches, Washington <u>55/</u>	300	34	April-Sept.	
Walla Walla, So. Fork near Milton, Oregon	53	80	April-Sept.	
Umatilla at Pendleton, Oregon	95	66	April-Sept.	
John Day, Middle Fork at Ritter, Oregon	40	37	April-Sept.	
North Fork at Monument, Oregon	201	37	April-Sept.	

Forecasts in California provided by Department of Water Resources.
Average is for 1958-72 period except California. California is computed for 1921-70 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.
Explanatory Notes on Forecasts listed on Inside Back Cover.

SELECTED STREAMFLOW FORECASTS

APRIL 1, 1977

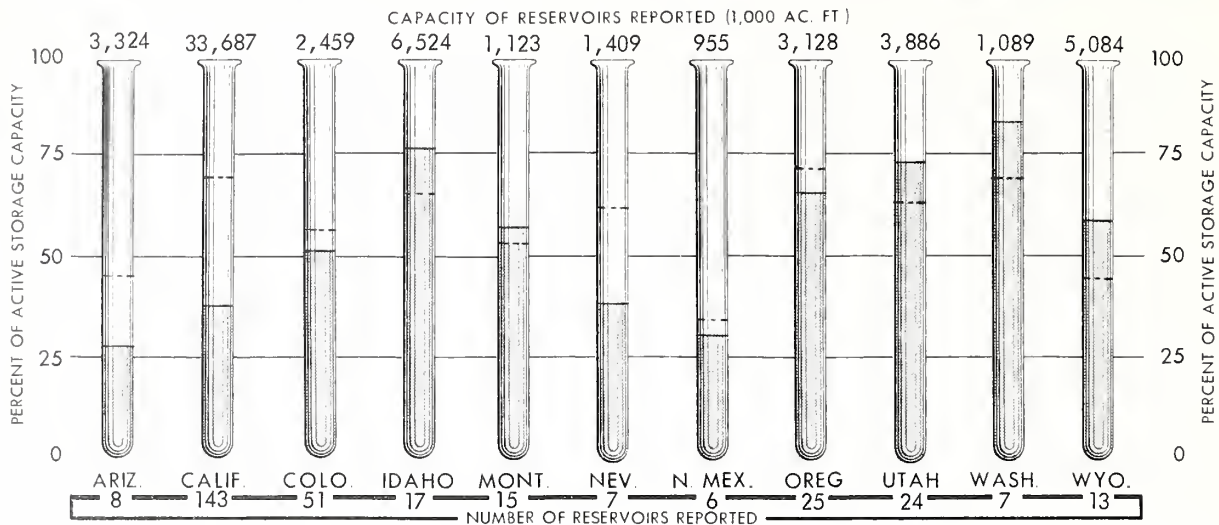
STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow In (1,000 A.F.)
	Flow In (1,000 A.F.)	Percent of Average		
LOWER COLUMBIA (continued)				
Crooked near Post, Oregon	24	26	April-Sept.	
Deschutes at Benham Falls, Oregon 40/	402	73	April-Sept.	
Columbia at The Dalles, Oregon 40/	30,650	42	April-June	79,164
at The Dalles, Oregon 40/	43,100	48	April-July	99,965
at The Dalles, Oregon 40/	55,200	53	April-Sept.	122,876
McKenzie near Vida, Oregon	850	67	April-Sept.	
Santiam, South, at Waterloo, Oregon	374	60	April-Sept.	
North, at Mehama, Oregon 40/	549	63	April-Sept.	
Clackamas at Estacada, Oregon	513	65	April-Sept.	
Willamette at Salem, Oregon 40/	3,065	62	April-Sept.	
Lewis at Ariel, Washington 56/	765	57	April-Sept.	1,333
Cowlitz at Castle Rock, Washington 57/	1,660	60	April-Sept.	3,030
NORTH PACIFIC COASTAL				
Dungeness near Sequim, Washington	115	70	April-Sept.	
Umpqua, No., near Toketee Falls, Oregon 40/	116	70	April-Sept.	
Rogue at Raygold, Oregon	596	67	April-Sept.	997
Klamath Lake, Net Inflow, Oregon	225	42	April-Sept.	499
Trinity at Lewiston, California	240	39	April-July	370
CALIFORNIA CENTRAL VALLEY 40/				
Sacramento, Inflow to Shasta, California	845	48	April-July	1,135
Feather near Oroville, California	510	27	April-July	565
Yuba at Smartville, California	190	18	April-July	270
American, Inflow to Folsom Res., California	210	16	April-July	312
Consumnes at Michigan Bar, California	10	8	April-July	15
Mokelumne, Inflow to Pardee Res., California	90	19	April-July	122
Stanislaus, Inflow to Melones Res., California	180	25	April-July	199
Tuolumne, Inflow to Don Pedro Res., California	275	23	April-July	330
Merced, Inflow to Exchequer Res., California	135	22	April-July	168
San Joaquin, Inflow to Millerton Lake, Calif.	230	19	April-July	350
Kings, Inflow to Pine Flat Res., California	200	17	April-July	303
Kaweah, Inflow to Terminus Res., California	50	19	April-July	75
Tule, Inflow to Success Res., California	4	7	April-July	13
Kern, Inflow to Isabella Res., California	80	19	April-July	104
ALASKA				
Yukon at Eagle, Alaska	31,000	90	April-July	35,920
at Ruby, Alaska	73,000	109	April-July	58,420
Porcupine near Fort Yukon, Alaska	8,500	118	April-July	8,919
Salcha near Calchaket, Alaska	470	61	April-July	428
Little Chena near Fairbanks, Alaska	74	80	April-July	69
Chena at Fairbanks, Alaska	360	64	April-July	348
Ship Creek near Anchorage, Alaska	90	152	April-July	54
So.Fk.Campbell at Canyon Mouth nr Anchorage, AK	20.4	153	April-July	12.5

Forecasts in California provided by Department of Water Resources
Average is for 1958-72 period except California. California is computed for 1921-70 period
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season
Explanatory Notes on Forecasts listed on Inside Back Cover

RESERVOIR STORAGE as of APRIL 1, 1977

--- AVERAGE

□ THIS YEAR



to date. March precipitation was 50 percent of average. In the Central Valley, precipitation was only 35 percent of average during March, varying from 45 percent in the Pit River Basin to 25 percent in the Kaweah River Basin.

Runoff was 20 percent of average during March, ranging from near zero in the San Francisco Bay Area to 35 percent of average on the West Walker River. Runoff for the period October through March continued to set new low records for all North Coast streams monitored, except Klamath River, and for all Central Valley streams, except the Kings and Kern Rivers. Even though snowmelt has started, there has been no corresponding increase in runoff because the water is being retained in the dry soil. Statewide, runoff for the October 1 through March 30 period has been 4,000,000 acre-feet or 18 percent of average.

Reservoir storage on April 1 was 55 percent of average in the 143 major reservoirs monitored, or 11.3 million acre-feet below average for this date. However, water in storage for some areas is as low as 28 percent of average. Central Valley reservoirs are storing 9.7 million acre-feet or 51 percent of average. Colorado River storage in Lakes Powell, Mead, Mohave, and Havasu is 130 percent of average.

COLORADO

During the month of March the mountain snowpack increased slightly more than normal over most of Colorado. However, approximately half of the snow courses measured were minimum of record for this time of year. The outlook for water supplies this summer remains bleak. Nearly all streams in Colorado are forecast to flow near or

below previous minimums. Water conservation will be necessary this summer.

The Yampa-White drainages in the northwestern corner of the state showed a snowpack increase of 10 to 15 percent in March. The Colorado Basin snowpack improved by as much as 15 percent. It is now 55 percent of normal.

The Front Range snow courses, those on the South Platte and its northern tributaries, indicated only a 5 percent improvement. They range from 30 to 60 percent of normal.

The Arkansas drainage had a slightly better than average snowfall month. The March 10-12 snowstorm contributed most of the snow.

The San Juan-Animas Basin was the only major basin where the snowpack did not improve. Some courses in this area are only half of their previous minimum.

The Rio Grande drainage improved 5 percent over last month, but is still only 30 percent of normal.

Summer streamflow forecasts for most of the state's rivers are near the minimum of record.

Forecasts on the South Platte streams range from 40 to 50 percent of normal. Good carryover storage in this area's many reservoirs will help supplement the poor streamflow.

Soil moisture in the South Platte drainage is reported as poor to fair.

The Arkansas River is expected to flow near the minimum of record, about half of normal. Pueblo Reservoir contains about 61,000 acre-feet compared to 43,000 acre-feet last year. But, downstream reservoir

STORAGE IN LARGE RESERVOIRS

APRIL 1, 1977

BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE	BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE
UPPER MISSOURI				UPPER COLUMBIA			
Belle Fourche	185	86	74	Chelan	676	205	115
Boysen	550	307	133	Coeur d'Alene	225	44	25
Buffalo Bill	373	175	130	Duncan	1,400	3	4
Canyon Ferry	2,043	1,709	109	Flathead	1,791	611	77
Fort Peck	19,140	15,830	119	Hungry Horse	3,428	2,186	101
Garrison	24,790	17,921	123	Kootenay	787	102	68
Hebgen	377	242	117	Lake Koocanusa	5,694	2,340	-
Keyhole	192	126	157	Lower Arrow	2,691	501	535
Lake Francis Case	5,816	4,110	101	Noxon Rapids	335	114	58
Lake Sharp	1,900	1,766	103	Pend Oreille	1,155	648	136
Oahe	23,630	19,450	119	Roosevelt	5,232	1,673	92
Tiber	1,347	489	82	Upper Arrow	4,400	591	172
Bighorn Lake	1,356	848	106				
PLATTE				LOWER COLUMBIA			
So. Platte in CO (30)	1,085	789	94	Cougar	155	37	50
City of Denver (7)	622	428	93	Detroit	300	69	39
Colo-Big Thompson (3)	718	251	60	Green Peter	270	110	67
Glendo	784	433	108	Hills Creek	200	16	13
Pathfinder	1,016	736	176	Lookout Point	337	52	30
Seminole	1,010	488	166	Prineville	153	100	81
				Wickiup	200	203	108
ARKANSAS				Yakima Res. (5)	1,066	890	121
Conchas	273	83	45	SNAKE			
John Martin	354	21	23	American Falls	1,125	1,123	112
Turquoise	130	26	-	Anderson Ranch	423	331	144
RIO GRANDE				Arrowrock	287	84	36
Elephant Butte	2,195	350	89	Brownlee	980	724	167
New Mexico Res. (4)	571	214	233	Cascade	653	364	119
UPPER COLORADO				Dworshak	2,016	718	300
Blue Mesa	830	380	120	Jackson	847	615	119
Flaming Gorge	3,749	2,756	174	Lucky Peak	278	240	201
Navajo	1,696	1,102	92	Owyhee	715	523	103
Powell	25,002	17,943	211	Palisades	1,200	1,166	147
Starvation	165	166	-	Warm Springs	191	87	73
LOWER COLORADO				PACIFIC COASTAL			
Havasu	619	567	102	Clair Engle	2,448	1,062	49
Mead	26,159	21,435	127	Clear Lake	440	210	84
Mohave	1,810	1,704	102	Nacimiento	350	45	20
Salt River Res. (4)	1,755	935	81	Ross	1,404	468	61
San Carlos	949	6	3	Upper Klamath	584	472	99
Verde River Res. (2)	318	9	6	CALIFORNIA			
GREAT BASIN				CENTRAL VALLEY			
Bear	1,421	1,058	108	Almanor	1,308	631	81
Deer Creek	150	97	101	Berryessa	1,602	983	63
Lahontan	291	196	90	Bullards Bar	961	296	49
Rye Patch	157	111	106	Folsom	1,010	285	43
Sevier Bridge	236	125	108	Isabella	570	63	33
Strawberry	270	210	176	McClure	1,026	207	32
Tahoe	732	140	31	Millerton	521	226	63
Utah	884	790	125	Oroville	3,538	1,565	54
Willard Bay	193	153	113	Pine Flat	1,002	292	45
				Shasta	4,552	1,460	37

Reservoir Storage Data Provided by Bureau of Reclamation, Corps of Engineers, Geological Survey and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively

storage is poor. Despite the March blizzard, soils are dry.

The Rio Grande and San Juan Basins will have extremely poor water supplies especially during the late summer season after the main snowmelt period. Carryover reservoir storage is only about 45 percent of normal and soils are dry.

The Colorado and Yampa-White Basins will also have very low summer streamflow, but generally require less water to supply demands.

Municipalities dependent upon direct flow from streams will have considerably less water than usual, especially during late summer.

IDAHO

A critically low water supply continues to be the outlook for Idaho during 1977. Record low seasonal flows are projected for rivers and streams throughout the state. Many small streams are expected to produce very little flow and may be dry by the end of the season. Forecasts of seasonal streamflow vary from a low of 10 percent of average for the Bear River at Harer to a high of 63 percent of normal for the Henry's Fork near Ashton.

Snowfall during March was above to well above normal on all watersheds in Idaho. The increase in snowpack accumulation, however, was not enough to overcome the extreme deficiencies existing on March 1. Practically all snow courses reported a record low snow water equivalent near April 1. In general, the maximum snowpack has accumulated by April 1 and as of April 1, 1977, the snowpack in Idaho ranges from a low of 14 percent of average on the Little Wood watershed to a high of 55 percent of normal on the Raft River. An extremely deficient snowpack exists on the Lost and Wood River drainages with the remainder of the state being somewhat more fortunate.

Soils beneath the snowpack are extremely dry and can be expected to absorb a significant amount of water before major runoff occurs. In many areas the soil will hold all the water in the snowpack.

Valley precipitation during March was near to above normal in northern and central Idaho and below to significantly below average in the remainder of the state. Temperatures averaged near or slightly below normal for the month.

Irrigation reservoir storage is near to above average for this time of year, however, due to low runoff projections and early irrigation demands, it is doubtful that any of the reservoir systems will fill this year.

MONTANA

Heavy snowfall occurred over most mountain ranges during March. This increased the snowpack by about 20 percent. However, about one-half of the snow courses in Montana still have the lowest water content of record. The western third of Montana continues to show deficient snowpack while central Montana has many areas that have near or above average snow. In contrast with the low snowpack in general, snow courses in the Snowy Mountains south of Lewistown have water content near the maximum of record. Soils under the snow are drier than normal.

In the Columbia River Basin snowfall during March was above average. This increased the seasonal snow accumulation by about 20 percent. However, over one-half the snow courses measured still have the lowest water content of record. Most areas have present snowpack between 50 and 70 percent average. Some areas have less than one-half their normal snow cover.

The snowpack on the Missouri River drainages varies from minimum of record at many snow sources on the west side of the drainage to maximum or near maximum of record in the Snowy Mountains. About one-half of the snow courses have the lowest water content of record for April 1 surveys.

The Yellowstone National Park area continues to have less than one-half average snowpack. Many snow courses have water content that is the lowest of record. Snow cover in the Bridger and Crazy Mountains is near average, while the northern portion of the Bighorn Mountains is above average. Other areas of the Beartooth and Aksarokee Mountains have snowpack about three-fourths of average. Soils under the snowpack are drier than normal.

Streamflow is forecast near the minimum of record for all streams in western Montana and streams flowing east with headwaters along the Continental Divide. This low water condition will carry on downstream through the Missouri and Yellowstone rivers. Major shortages in irrigation water supply are expected by the end of June on most streams not having stored water.

Columbia Basin rivers will yield their second to fourth lowest volumes on record while the Missouri Basin yields will be from the lowest to fifth lowest. Many Yellowstone tributaries are forecast to yield new record minimums, except for streams heading in the Bridger and Crazy Mountains as well as Red Lodge Creek.

Reservoir storage remains near average for this date and can be expected to provide adequate supplemental water to downstream users.

NEVADA

The water supply outlook for this summer is poor. Snowfall during March continued below normal in all areas except the Ruby Mountains in Elko County. Streamflow forecasts have not improved and many are lower than last month's.

Snowpack measurements for April 1 indicate the eastern slope of the Sierra's has 25 to 35 percent of the 1958-72 average. The storms during the month added only small amounts of water to the snowpack. Many snow courses set new minimum records. Only 24 percent of average has accumulated on the Walker, with 34 percent in the Tahoe basin, with other Sierra Nevada watersheds having a similar low pack. On the Humboldt range and Ruby Mountains, March snows brought substantial improvement, but the high elevation pack remains far below average.

The Owyhee snowpack is now about one-half of normal, while in the Ely area there is only one-third the average April 1 pack. The Surprise Valley has about 45 percent of normal.

Streamflow from the Sierra Nevada is forecast to be less than last year and near the historic minimum yields. Humboldt basin forecasts are also near the record lows. The Surprise Valley streams will flow very little this season.

Lake Tahoe is forecast to rise only 0.15 feet, if the outflow gates were closed, which is less than 10 percent of normal. The West Walker is forecast to yield 31 percent of average, but the Humboldt is expected to flow only 10 percent of its normal.

Reservoir storage remains poor in the Sierra's. The combined total of Lake Tahoe, Boca, Lahontan, Topaz and Bridgeport is 393,000 acre-feet compared to an average of 729,000 acre-feet and last year's 824,000 acre-feet. Stampede Reservoir contains 38,000 acre-feet. Statewide, the reservoir storage is about two-thirds of the normal level for April 1.

NEW MEXICO

The water supply outlook is poor in New Mexico. Water users depending on direct diversion will be hardest hit. Reservoir storage will provide good supplemental supplies. Middle and late season irrigation supplies will be short.

The mountain snowpack did not improve materially during March. The snowpack in the headwaters of the Rio Grande remains only 25 percent of normal. Snowpack on tributary streams of the Rio Grande in the northern portion of the state is

slightly better but still much below average. The snowpack has already begun melting and will be completely gone within a month. The poor winter snowfall means streamflow on the Rio Grande and Rio Chama will flow only about half of normal. The only area which may have near normal flow is the Pecos drainage.

Much above average spring and summer precipitation is needed to improve the poor water supply outlook. Soil moisture remains deficient in nearly all areas. Carryover reservoir storage is about 90 percent of normal.

OREGON

The summer water supply outlook remains poor for most of the state of Oregon. The mountain snowpack is still much below normal, even though above average amounts were deposited during this past month. Reservoir storage is slightly below normal now and levels will continue to drop as water deliveries are made for irrigation and other uses.

The extreme dryness in Oregon that started last fall was broken this past month in the northern part of the state, with above normal precipitation amounts recorded. Below normal precipitation was received in the rest of the state, as has been the situation for the past six months. The Willamette, Umatilla and the Hood River basins recorded precipitation amounts of 108, 118 and 123% of normal. The southern half of the state received 90% in the Rogue basin and 30 to 50% east of the Cascade mountains.

Snow courses recorded 1 1/2 to 3 times the normal increases in water equivalent for the month. The deficit in the snowpack was so large that the snow cover remains much below normal in most areas. The snow cover now ranges from a low of 23% in Lake County, up to 78% in the Blue Mountains above Pendleton.

The mountain soils are still very dry. Valley soils are in good condition for moisture west of the Cascades and are dry in eastern Oregon.

Twenty-six major irrigation reservoirs were storing 2,090,000 acre-feet of water on April 1. This is only a slight increase from last month and is 91% of average. Many reservoirs will still not fill as summer streamflow is forecast to be much below normal.

Streamflow this past month was still below average in all areas, even with the above normal precipitation received in the northern areas of the state. Streamflow this spring and summer is expected to remain much below normal. Streamflow forecasts for representative Oregon streams

include 29% from the Owyhee, Malheur 17%, Klamath Lake inflow 42%, Middle Fork John Day 37%, Grande Ronde 61%, Willamette 63%, and the Deschutes 73% of normal.

UTAH

Utah continues to be headed for severe water shortages for areas without reservoir storage. Snow cover this year is only 43% of average, and well below previous minimums. Streamflow forecasts range from 3 to 60% of their April-July averages with many streams forecast below the previous low year of 1934. Reservoir storage continues to be the only bright spot with the state's storage facilities at 113% of their April 1 averages.

Snow surveys taken during the last days of March and the first few days of April indicate new record low water contents on 70 out of 160 snow course measurements taken. Despite marked increases in many areas of the state during March, snow cover ranges from only 8% to 89% of average.

Some areas received sharp increases in snow depths. However, the snow was exceptionally dry for this time of year with densities well below typical April 1 figures.

The west central portion of the state ranges from 54 to 89% while the southern and eastern reaches vary from 8 to 51%. The northern half of Utah has a snow pack from 36 to 67% of normal.

The Jordan River and Tooele Valley watersheds showed the greatest improvement from March 1, and now range from 64 to 84% of the April 1 average.

Some improvement was seen in the watershed soils. However, they remain drier than normal for this time of the year. Dry soils are sure to further reduce the snowmelt runoff this year.

Forecasts range from a low of 3% (of average April-July) for the Duchesne at Randlett to 60% for Farmington Creek near Farmington, Utah. Other forecasts include Bear River at Utah-Wyoming state line, 40%; Bear River at Harer, 10%; Logan River 34%; Weber at Oakley, 44%; Pineview Reservoir inflow, 26%; and Little Cottonwood Creek near Salt Lake, 50%.

The Provo River near Hailstone is expected to produce 25% of its normal while the Price River forecast is for 11% at Heiner, and the Sevier River is forecast at 29% at Hatch.

WASHINGTON

The snowpack across the state and in the adjacent tributary basins of British

Columbia, Idaho and western Montana have all improved in last month. However, the snowpack is still well below normal. As a result, forecasts of snowmelt runoff have been raised from that which was reported last month. Even so, serious water shortages are expected throughout the state.

The snowpack in the Upper Columbia Basin is now 42 percent of normal with a range from a low of 32 percent on Yakima Basin to a high of 54 percent for the Kettle. In the Lower Columbia drainage, the pack now ranges from 39 percent of normal on the Cowlitz to 56 percent in Mill Creek, a tributary of the Walla Walla River. The best improvements occurred in the Puget Sound area. The Cedar River watershed, the main water supply for the city of Seattle, improved 52 percent from its March 1 measurement of 4 percent of normal to the April 1 reading of 56 percent. On the Olympic Peninsula, the snow courses indicate an improvement of 44 percent during March, up to 53 percent of normal currently.

Reservoir storage is variable, but generally above normal for this date. Normally, many reservoirs are reducing storage in anticipation of coming snowmelt runoff. However, there has been no release of water and many reservoirs may not fill.

March runoff was all below normal and some well below normal. The high point was the Skagit River, as measured at Concrete, which was 89 percent of normal; this corrected for storage at Ross, Diablo, and Gorge Reservoirs. The low point occurred into the southeastern portion of the state where the Palouse River, as measured at Hooper, had a flow that was only 16 percent of average. The main stem of the Columbia River, as measured at The Dalles, had a flow that was less than half of normal - 45 percent. Forecasts have all been revised and generally improved from that which was reported last month. The low point is still the Yakima River at Parker, but even at this point the forecast has been improved 6 percent. Most rivers are forecast to yield from one-third to three-fourths their average quantities.

WYOMING

Severe water shortages are forecast for the south and west portions of the state for water users without adequate reservoir storage. The northeast corner of the state can expect above normal amounts during the spring and summer months.

Although the mountain snowpack increased significantly throughout the state, the pack along the Continental Divide is still only 40 percent of normal. The northeast portion of the state continued to receive

heavy snows and the snowpack is now 125 percent of average in the northern portion of the Bighorns and nearly twice the April first average in the Black Hills. In the southeast portion of the state, the Laramie and North Platte Watersheds range from 50 to 75 percent of normal.

Increases in the snowpack have resulted in improved streamflow forecasts for the central and eastern portions of the state, but little or no change has occurred on the west side. Streamflow volumes are expected to range from only 20 percent of average in the southwest to half the nor-

mal amount in the northwest. Volumes are expected to be the lowest on record in many areas. Streamflow volumes will be much above normal in the northeast corner of the state, and generally 50-70 percent of normal throughout the remainder of the state.

Reservoir levels in the Belle Fourche watershed are being held at a low level in anticipation of the heavy spring runoff from the Black Hills. Throughout the remainder of the state reservoir storage is excellent and should help compensate for the low streamflows.



EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Storage change in Lake Sherburne. 2/ Storage change in Lima and Clark Canyon reservoirs. 3/ Storage change in Hebgen Lake. 4/ Storage change in Gibson Reservoir and measured diversions. 5/ Storage change in Two Medicine, Four Horns, Lake Francis and Swift reservoirs. 6/ Storage change in Canyon Ferry and Tiber reservoirs. 7/ Changes as indicated in (6/), (8/), plus storage change in Fort Peck. 8/ Storage change in Boysen, Buffalo Bill, Bull Lake and Yellowtail reservoirs. 9/ Storage change in Buffalo Bill Reservoir plus Heart Mountain diversion. 10/ Storage change in Pilot Butte and Bull Lake reservoirs plus Wyoming canal diversion.

11/ Changes indicated in (10/) plus storage change in Boysen Reservoir. 12/ Plus diversions to Cache LaPoudre. 13/ Plus by-pass to power plants. 14/ Minus diversion thru Gumlick Tunnel. 15/ Storage change in Price Reservoir. 16/ Minus diversions from North Platte, Laramie and Colorado rivers plus measured diversions above station. 17/ Storage change in Clear Creek, Twin Lakes and Turquoise reservoirs minus diversions from Colorado River. 18/ Storage change in Rio Grande, Santa Maria and Continental reservoirs. 19/ Storage change in El Vado and Abiquiu reservoirs. 20/ Storage change in Platoro Reservoir.

21/ Storage change in Grandby Reservoir as furnished by U.S.B.R. plus diversions by Adams Tunnel and Grand River Ditch. 22/ Changes as indicated in (21/) plus diversions thru Roberts, Gumlick and Moffat tunnels and storage change in Dillon, Homestake, Williams Fork, Green Mountain and Willow Creek reservoirs. 23/ Changes indicated in (22/) and (26/). 24/ Storage change in Blue Mesa Reservoir. 25/ Changes indicated in (24/), (30/) and (35/) and storage change in Lake Powell. 26/ Diversions to Arkansas River plus storage change in Ruedi Reservoir. 27/ (Inflow record as computed by U. S. Bureau of Reclamation.) 28/ Storage change in Taylor, Blue Mesa and Morrow Point reservoirs. 29/ Storage change in Fontenelle Reservoir. 30/ Storage change in Flaming Gorge Reservoir.

31/ Plus diversion through Duchesne Tunnel. 32/ Storage change in Moon Lake Reservoir. 33/ Storage change in Scofield Reservoir. 34/ Storage change in Joe's Valley Reservoir. 35/ Storage change in Navajo Reservoir. 36/ Plus U. P. & L. Co. tailrace and Logan, Hyde Park and Smithfield canals. 37/ Minus diversions thru Duchesne Tunnel and Weber-Provo Canal. 38/ Storage change in Lake Tahoe and Boca reservoirs (Forecast by Truckee Basin Committee.) 39/ Storage change in Bridgeport Reservoir. 40/ Corrected for major upstream impairments -- represents simulated natural flow conditions.

41/ Storage change in Priest Lake. 42/ Storage change in Coeur d'Alene Lake and diversions by Spokane Valley Farms Co. and Rathrum Prairie canals. 43/ Storage change in Lake Chelan. 44/ Storage change in Jackson Lake. 45/ Storage change in Jackson Lake and Palisade reservoirs. 46/ Storage change in Jackson Lake, Palisades, Island Park, Henry's Lake, Grassy Lake plus diversions between Heise and Blackfoot. 47/ Storage change in Henry's Lake and Island Park reservoirs. 48/ Storage change in Mackay Reservoir and diversion in Sharp Ditch. 49/ Combined flow Big Wood near Bellevue and Camas Creek near Blaine. 50/ Storage change in Arrowrock, Anderson Ranch and Lucky Peak reservoirs.

51/ Storage change in Wild Horse Reservoir. 52/ Storage change in Cascade and Deadwood reservoirs. 53/ Storage change in Keechelus, Kachess and CleElum reservoirs plus diversion by Kittitas Canal. 54/ Changes indicated in (52/) plus storage change in Bumping and Rimrock Lakes plus diversion by Roza, Union Gap, New Reservation, Old Reservation and Sunrise canals. 55/ Storage change in Bumping and Rimrock lakes and diversions by Tieton, Selah Valley, Wapatox canals and City of Yakima. 56/ Storage change in Merwin, Yale and Swift reservoirs. 57/ Storage change in Mayfield Reservoir.

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